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EXAMINER

CAO, PHAT X

ART UNIT PAPER NUMBER

2814

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/197,767

Applicant(s)
Ohtani et al.

Examiner
Phat X. Cao

Art Unit
2814



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Sep 20, 2001
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6, 9, 10, 15, 16, 22-27, 40, and 46-74 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 9, 10, 15, 16, 22-27, 40, and 46-74 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- *See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 18) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____

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DETAILED ACTION

1. The cancellation of claims 7-8 and 13-14 in Paper No. 16 is acknowledged.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 112

3. Claims 68-74 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

These claims are unclear because how is the interlayer insulating film made from a metal?

4. Claims 68-74 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The limitation of having “the interlayer insulating film [is] made from a metal” [emphasis added] is not supported by the original disclosure.

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Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 47, 51, 55, 59, 63, and 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (US. 6,081,305) in view of Fukunaga et al (US. 5,706,064).

Sato et al disclose in Fig. 2 a semiconductor device comprising: a transistor; at least one interlayer insulating film 170 formed over the transistor, the interlayer insulating film 170 having a contact hole; an embedded conductive layer 171 provided to fill the contact hole wherein a top surface of the embedded conductive layer 171 is flush with a top surface of the interlayer insulating film 170; and a reflective pixel electrode 181 formed on the interlayer insulating film 170 wherein the reflective pixel electrode 181 is electrically connected to the transistor through the embedded conductive layer 171.

Sato et al do not disclose the embedded conductive layer 171 being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5,

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lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Sato's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34).

7. Claims 2, 22-27, 40, 48, 52, 56, 60, and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al in view of Yamazaki (US. 5,990,542) and Fukunaga et al.

With respect to claims 2, 48, 52, 56, 60, and 64, as discussed above, Fig. 2 of Sato et al substantially reads on the claimed invention, except that it does not disclose the interlayer insulating film 170 comprising an organic resin.

However, Yamazaki teaches in Fig. 2B the obviousness of forming the interlayer insulating film 120 made of organic resin (column 5, lines 65-67). Accordingly, it would have been obvious to form the interlayer insulating film 170 of Sato et al with an organic resin, because according to Yamazaki, the interlayer insulating film made of the organic resin would suppress an electric field from the pixel electrode created later from being disturbed (column 6, lines 1-6).

Neither Sato nor Yamazaki discloses the embedded conductive layer being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column

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20, lines 36-48) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Sato's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34).

With respect to claims 22-27 and 40, Fukunaga et al also teach in column 1, lines 5-30 that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display device has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to one ordinary skill in the art to apply the display device of Fukunaga et al to a display device of a cellular phone, a camcoder, etc., because it is an intended use.

8. Claim 3, 22-27, 40, 49, 53, 57, 61, and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al in view of Okita (US. 6,097,453) and Fukunaga et al.

With respect to claims 3, 49, 53, 57, 61, and 65, Sato et al disclose in Fig. 2 a semiconductor device comprising: a transistor; a first interlayer insulating film 130 formed over the transistor; a drain electrode 141 formed on the first interlayer insulating film and electrically connected to a drain of the transistor through an opening of the first interlayer insulating film; a second interlayer insulating film 150 formed over the drain electrode and the first insulating film; a capacitor forming electrode 165 formed on the second interlayer insulating film 150 to form a capacitor between the drain electrode 141 and the capacitor forming electrode 165; a third interlayer insulating film 170 formed over the capacitor forming electrode and the second

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interlayer insulating film; contact holes 171 and 151 opened through the third and second interlayer insulating films to reach the drain electrode; an embedded conductive layer filled in the contact holes; and a reflective pixel electrode 181 is electrically connected to the drain electrode through the embedded conductive layer.

Sato et al do not disclose that the contact holes 171 and 151 are formed as a single contact hole opened through the third and second insulating films.

However, Okita teaches in Fig. 6 the obviousness of forming a single contact hole 508 opened through the third insulating film 109 and second insulating film 601 to reach the drain electrode 108. Accordingly, it would have been obvious to modify the contact holes 171 and 151 of Sato et al by forming a single contact hole, because as is well known, the forming of a single contact hole as taught by Okita would reduce the number of steps in fabricating process.

Neither Sato nor Okita discloses the embedded conductive layer being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Sato's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34).

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With respect to claims 22-27 and 40, Fukunaga et al also teach in column 1, lines 5-30 that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display device has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to one ordinary skill in the art to apply the display device of Fukunaga et al to a display device of a cellular phone, a camcoder, etc., because it is an intended use.

9. Claims 4, 50, 54, 58, 62, and 66 are is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al in view of Okita, Yamazaki, and Fukunaga et al.

As discussed in details above, the combination of Sato et al and Okita substantially reads on the claimed invention, except it does not disclose the third interlayer insulating film 170 comprising an organic resin.

However, Yamazaki teaches in Fig. 2B the obviousness of forming the interlayer insulating film 120 made of organic resin (column 5, lines 65-67). Accordingly, it would have been obvious to form the interlayer insulating film 170 of Sato et al with an organic resin, because according to Yamazaki, the interlayer insulating film made of the organic resin would suppress an electric field from the pixel electrode created later from being disturbed (column 6, lines 1-6).

None of the above references discloses the embedded conductive layer being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5,

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lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Sato's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34).

10. Claims 5, 16, 22-27, 40 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al in view of Fukunaga et al (US. 5,706,064).

With respect to claims 5 and 46, as discussed above, Fig. 2 of Sato et al substantially reads on the claimed invention, except it does not disclose that the embedded conductive layer comprises a same resin as the resin of the interlayer insulating film.

However, Fukunaga et al teach in Fig. 17 the obviousness of forming an embedded conductive layer 411b comprising a same resin as the resin of the interlayer insulating film 413 (see column 19, lines 27-35 and column 42, lines 50-52), wherein the embedded conductive layer 411b comprises an organic resin film containing a conductive material dispersed therein or an inorganic film containing a conductive material disperse therein (column 41, lines 22-32). Accordingly, it would have been obvious to form the embedded conductive layer and the interlayer insulating film with the resin as set forth above, in order to provide a substrate for a display device which can be used in liquid crystal in a high speed response mode and achieves a low price, such as taught by Fukunaga et al (column 1, lines 55-59).

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With respect to claim 16, Fukunaga et al further teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61), and one of the two conductive layers is in contact with an alignment film 517 (number 517 not shown in Fig. 17, see Fig. 27).

With respect to claims 22-27 and 40, Fukunaga et al also teach in column 1, lines 5-30 that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display device has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to one ordinary skill in the art to apply the display device of Fukunaga et al to a display device of a cellular phone, a camcoder, etc., because it is an intended use.

11. Claims 6 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki (US. 5,990,542) in view of Jun (US. 5,948,705).

Yamazaki discloses in Fig. 2B a semiconductor device comprising: a transistor; at least one interlayer insulating film 120 comprising an organic resin formed over the transistor, the interlayer insulating film 120 having a contact hole; a conductive layer 121 made of ITO formed on the interlayer insulating film wherein the conductive layer 121 extends into the contact hole and electrically connected to the transistor.

Yamazaki does not disclose a metal electrode formed on the conductive layer as claimed.

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However, Jun teaches in Fig. 4E the obviousness of forming a metal electrode 48 on the embedded conductive layer 47, wherein at least one peripheral edge of the metal electrode 48 is coextensive with a peripheral edge of the embedded conductive layer 47. Accordingly, it would have been obvious to modify the conductive structure of Yamazaki by forming a metal electrode with the structures as set forth above for improving step coverage and for preventing a recess formation in the contact hole, such as taught by Jun (column 7, lines 35-41).

12. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki and Jun as applied to claim 6 above, and further in view of Fukunaga et al (US. 5,706,064).

Neither Yamazaki nor Jun disclose the conductive layer comprising carbon dispersed in an organic or comprising a material selected from the group consisting of Zinc oxide, aluminum flakes and nickel flakes.

However, Fukunaga et al teach the obviousness of forming the embedded conductive layer 411b made of inorganic oxide conductive layer of ITO or ZnO (column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-37) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form the embedded conductive layer with the materials as set forth above, in order to provide a substrate for a display device which can be used in liquid crystal in a high speed response mode and achieves a low price, such as taught by Fukunaga (column 1, lines 55-59).

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Response to Arguments

13. Applicant's arguments filed 9/20/01 have been fully considered but they are not persuasive.

- With respect to title change, the new title of "SEMICONDUCTOR DEVICE" is still not clearly indicative of the invention to which the claims are directed.

- With respect to Sato et al, Applicant argues that Sato does not disclose "a conductive material selected from the group consisting of Carbon, Zinc oxide, aluminum, and nickel" as amended.

The Examiner agrees. However, Applicant's arguments are not persuasive because Fukunaga does teach the obviousness of forming Sato's embedded conductive layer with the material as set forth above for the purpose of providing a color liquid crystal display devices having high speed response, low power consumption, and low prices (see ground of rejections for more details).

- With respect to the combination of Yamazaki and Jun, Applicant argues that it is not obvious to combine them because Jun fails to teach the formation of a pixel electrode.

Applicant is noted that Jun is not relied on for teaching the formation of the pixel electrode. Yamazaki discloses the formation of the pixel electrode. Jun is relied on for teaching the known structure of forming the metal electrode on the embedded conductive layer as claimed. Therefore, it is obvious to combine Jun with Yamazaki because they both teach the formation of the metal electrode on the embedded conductive layer.

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Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (703) 308-4917. The Examiner can normally be reached on Monday through Thursday. If attempts to reach the Examiner by telephone are unsuccessfully, the Examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. Group 2800 fax number is (703) 308-7722 or (703) 308-7724.

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PC

December 16, 2001



PHAT X. CAO
PRIMARY EXAMINER